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Abstract:

In this paper, we use U.S. commercial banks' data to investigate whether the effect of unexpected deposit flows on loan production depends on banks' exposure to off-balance sheet funding liquidity risk. We find that lending is sensitive to deposit shocks at small banks but not at large ones. Furthermore, for small banks, the increase in lending explained by unexpected deposit inflows depends on how much they are exposed to funding liquidity risk stemming from their off-balance sheets, as measured by the level of unused commitments. Small banks more exposed to such funding liquidity risk tend to extend fewer new loans. Our results indicate that unexpected deposit inflows from, for instance, the failure of other banks or market disruptions might not as easily be fueled again to borrowers.

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1. Introduction

In the aftermath of the global financial crisis of 2007-2009 (GFC), regulators recognized the need to implement liquidity requirements as policy tools in addition to capital adequacy rules. Hence, the Basel Committee on Banking Supervision (BCBS) implemented the Net Stable Funding Ratio (NSFR) which requires banks to soundly manage their liquidity exposure both for their balance sheet and off-balance sheet operations. In this regard, banks are forced to reduce their reliance on market liquidity (e.g. by holding more deposits) to fund their illiquid assets (such as loans) and to cover the potential liquidity risk arising from their off-balance sheet exposures. Banks are therefore expected to account for their exposure to funding liquidity risk stemming from on-and off-balance sheets in the production of their illiquid assets.

In this paper, we analyze the effect of an unexpected flow of deposits on banks' new loan production. Specifically, we investigate whether this effect is dependent on banks' off-balance sheet funding liquidity risk. We define the unexpected flow of deposits as the part of deposit flows at banks which is not explained by banks' specific and macroeconomic variables.

As documented by previous studies, banks with higher deposits can play a crucial role in the financing of the real economy. This is because deposits are at the heart of bank lending and liquidity creation. For instance, Acharya and Naqvi (2012) show that banks that experience large amounts of deposit inflows, have incentives to lower lending standards in order to increase loan production. Brei et al. (2013) document that banks with a lower reliance on market funding, measured by a higher share of deposits, tend to supply more loans. Cornett et al. (2011) also show that during the GFC, banks that relied more on core deposits continued to lend more than other banks.

Banks also provide liquidity to their customers under the form of credit lines. However, the option offered to such customers to withdraw funds when needed from existing credit lines generates a funding liquidity risk at banks which may limit banks' incentives to extend new loans. For example, after the failure of Lehman Brothers in September 2008, firms increased the drawdowns on preexisting credit lines. Thus, banks with higher exposure to funding liquidity risk stemming from loan commitments were less willing to produce new loans during the GFC (Cornett et al., 2011, Ivashina and Scharfstein, 2010). An important issue which has not yet been addressed in the literature is whether and to which extent banks account for their exposure to off-balance sheet funding liquidity risk, in their loan provision, when they experience an unexpected flow of deposits. This issue is of major importance for regulators, policymakers and for the financing of the real economy. Better understanding banks' lending

behavior is crucial for regulators to improve regulatory tools and to maintain a sound banking system.

To conduct our investigation, we use a large sample of U.S. commercial banks covering the 1990Q2-2015Q2 period. Because of their appetite for risk and their more or less easy access to funds to finance their activities, banks' lending behavior can vary according to their size and to their more or less stable environment. Therefore, we account for banks' size and the GFC. Managers of banks holding fewer liquid assets may also care more about their off-balance sheet liquidity risk exposure. To compute our main proxy of unexpected deposit flows, we use the residuals of a model explaining deposit flows at the individual bank level . For robustness considerations we also use alternative measures.

Our findings show that large banks do not respond to an unexpected change in their deposits by adjusting their lending. However, small banks significantly react to such unexpected movements. Large banks might not be influenced by negative deposit shocks because they have easier access to the market than small banks. But whereas small banks significantly increase their loan production when they experience unexpected deposit inflows, large banks do not change their lending policy. Nevertheless, under such circumstances, small banks more exposed to off-balance sheet funding liquidity risk tend to produce fewer loans than those that are less exposed. In other words, the impact of unexpected deposit inflows on loan origination by small banks is negatively associated with the exposure to off-balance sheet funding liquidity risk. This negative relationship is found to be tighter during the GFC and concentrated in the subsample of small banks with fewer holdings of liquid assets.

This paper brings some important insights on the lending behavior of banks. The positive effect we find for small banks of unexpected deposit inflows on new loans extension, is consistent with the theoretical work of Acharya and Naqvi's (2012) according to which the inflow of deposits leads banks' managers to decrease lending standards in order to lend more. This view is also documented by Khan et al. (2017). They bring evidence that banks with lower funding liquidity risk (proxied by a higher ratio of deposits to total assets), especially small ones, take more risk. However, in our study we focus on unexpected deposit flows and banks' new loan production and especially, we show that this loan creation after an inflow of deposits is not uniform. The exposure to off-balance sheet funding liquidity risk matters.

We also complete the results of Cornett et al. (2011) and Ivashina and Scharfstein (2010) who document that banks highly exposed to funding liquidity risk stemming from unused commitments extended less loans during the GFC. Indeed, in our paper, we show that this attitude also holds during normal times and especially for small banks even when they

experience positive deposit shocks. Overall, our results indicate that unexpected deposit inflows might not as easily be fueled again to borrowers.

The remainder of the paper is organized as follow. In section 2, we present our data and the methodology. In section 3, we present the results. Section 4 discusses further issues. In section 5, we provide the robustness checks and section 6 concludes.

2. Data and Methodology

2.1. Presentation of the sample:

Our dataset consists of an unbalanced panel of quarterly data for U.S. commercial banks from 1990Q2 to 2015Q2. It contains 599,263 bank-quarter observations for 13,757 banks. Bank-quarters with missing information on total assets, total deposits, net loans and unused commitments are excluded. We focus on commercial banks because they are more involved in lending activities. Our data come from two different sources. Macroeconomic data come from the federal reserve bank of St Louis[2] and bank level data from SNL Financial. Because, banks' lending behavior may be different according to their size, we split the sample in two groups. Following the literature and the classification used by the Uniform Bank Performance Report (UBPR), banks are considered to be large, if their total assets are higher than $1 billion and small banks are those with total assets lower or equal to $1 billion. Hence, our sample contains 570,611 bank-quarter observations for small banks and 28,652 bank-quarter observations for large ones. To deal with the issue of possible outliers, we winsorize our variables at the 2nd and 98th percentiles of the sample distributions.

2.2. Definition of variables:

2.2.1. Dependent variable:

The aim of this paper is to study the effect of an unexpected flow of deposits on new loan extension. Banks' lending can increase not only because of the production of new loans but also because of the drawdowns of preexisting loan commitments. Therefore, we capture the production of new loans by following Berger et al. (2017), Kim and Sohn (2017) and Cornett et al. (2011) and use the growth rate of the sum (total net loans plus unused commitments) as the dependent variable. As highlighted by Cornett et al. (2011), loan commitment drawdowns

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[2] See http://research.stlouisfed.org/

do not affect this measure of loan supply because the drawdowns of unused commitments increase loans and decrease undrawn commitments by the same amount. Hence, an increase in our dependent variable shows the production of new loans and underlines banks' managers willingness to extend loans.

2.2.2. Off-balance sheet funding liquidity risk:

We follow Cornett et al. (2011) and measure the exposure to off-balance sheet funding liquidity risk by considering the level of unused commitments. We define the variable OBFLR as the ratio of total unused commitments over the sum of total unused commitments plus total assets. Higher levels of this ratio capture higher exposures to off-balance sheet funding liquidity risk.

2.2.3. Unexpected deposit flows:

To measure unexpected deposit flows, we follow the procedure used by Karolyi et al. (2018) to capture unexpected bank flows. According to banks' size, we first regress banks' deposit flows on variables known to affect them in prior works (see e.g. Chen et al., 2019; Acharya and Mora, 2015; Nys et al., 2015; Finger and Hesse, 2009; etc.) through the following model:

$$\Delta \text{dep}_{i,t} = \beta X_{i,t-1} + \delta_i + \phi_t + \eta_{i,t} \tag{1}$$

Where $\Delta \text{dep}_{i,t}$ is deposit flows measured as the changes in bank i's deposits at t, normalized by lagged total assets; $X_{i,t-1}$ is a vector of variables likely to explain deposit flows. It contains the natural logarithm of total assets to account for bank size, cost of interest bearing deposits to account for the cost of deposits, equity capital over total assets to account for capitalization, non-performing loans to total loans to account for credit risk, return on equity to account for profitability, the share of loans secured by real estate in the loan portfolio to account for real estate exposure, OBFLR for liquidity demand and a dummy for mergers and acquisitions. δ_i serves to capture bank i's individual fixed effect to account for time invariant differences in business models and ϕ_t captures time fixed effects included to account for macroeconomic factors[3] that influence the flow of deposits. We cluster standard errors at the bank level and use fixed effect estimators. We then extract from the residual $\eta_{i,t}$ from the model which

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[3] For robustness tests, we use as macroeconomic factors the TED spread and change in the consumer price index instead of time fixed effects.

corresponds to unexpected deposit flows at bank i in time t. This is the component of deposit flows at banks which is not explained by banks characteristics and time effects (or macroeconomic variables).

For robustness, we also measure unexpected deposit flows by considering the method used by Soedarmono et al. (2017) and Foos et al. (2010) to compute abnormal loan growth that they define as the gap between an individual bank's loan growth and the median loan growth of banks in the same year and country. Thus, specifically, instead of using the residuals of a deposit growth model or a deposit change model, we consider deviations from banking industry averages or medians.

2.2.4.   Descriptive statistics:

The definition and general descriptive statistics of our variables are presented in table 1A. On average over our investigation period, the growth rate of the sum of total net loans and unused commitments is 1.60%. On average, the exposure to off-balance sheet funding liquidity risk is 12.07% and 1.31% of bank loans are non-performing loans The average return on equity is 10.33% and average equity over total assets ratio is 10.32%. The exposure of sample banks to real estate loans is on average 57.67%.

Table 1B presents mean-difference t-tests for our main variables during normal and crisis times and according to bank size. Considering small banks, on average, they produced more loans in normal times. In such times, the mean of the growth rate of the sum of total net loans plus unused commitments is 1.62% against 1.30% during the crisis. On average, their exposure to off-balance sheet funding liquidity risk was more important during the crisis period (14.96%) than during normal times (11.55%). Large banks also produced more loans in normal times (1.65%) than during the crisis period (1.18%) on average. However, conversely to small banks, they were less exposed to off-balance sheet funding liquidity risk during the crisis period (10.16%) than in normal times (11.40%). Appendix A displays the pairwise correlation matrix between our variables and does not reveal major multicollinearity issues.

[insert table 1A & table 1B]

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2.3.Empirical specifications:

We use a dynamic panel regression model as most studies on bank lending (See e.g. Kim and Sohn. 2017; Brei et al 2013; Drehmann and Gambacorta. 2012 and others), We first model the production of new loans as a function of unexpected deposit flows, banks' exposure to off-balance sheet funding liquidity risk and other bank-specific variables. To examine whether and to which extent the effect of unexpected deposit flows is conditional to banks' exposure to off-balance sheet funding liquidity risk, we then construct our baseline model by adding the interaction of unexpected deposit flows with banks' exposure to off-balance sheet funding liquidity risk. The specifications are given by:

$$\Delta loan_{i,t} = \gamma_i + \theta_t + \alpha_1 \Delta loan_{i,t-1} + \alpha_2 UDF_{i,t-1} + \alpha_3 OBFLR_{i,t-1} \qquad (2)$$
$$+ \alpha Z_{i,t-1} + \rho_{i,t}$$

$$\Delta loan_{i,t} = \gamma_i + \theta_t + \omega_1 \Delta loan_{i,t-1} + \omega_2 UDF_{i,t-1} + \omega_3 OBFLR_{i,t-1} \qquad (3)$$
$$+ \omega_4 UDF_{i,t-1} * OBFLR_{i,t-1} + \omega Z_{i,t-1} + \mu_{i,t}$$

Where $\Delta loan_{i,t}$ is the growth rate of the sum of total net loans and unused commitments of bank i at time t; γ_i captures bank i's individual fixed effect; θ_t is a time fixed effect[4]; $UDF_{i,t-1}$ stands for the unexpected deposit flows for bank i at time $t-1$; $OBFLR_{i,t-1}$ is the exposure to off-balance sheet funding liquidity risk; $Z_{i,t-1}$ is a vector of control variables known to explain bank lending. It contains the natural logarithm of total assets to account for bank size, equity capital over total assets to account for banks' capitalization, non-performing loans to total loans to account for credit risk, return on equity to account for profitability, the share of loans secured by real estate in loan portfolio to account for real estate exposure and a dummy for mergers and acquisitions. Variables on the right-hand side are lagged one period to mitigate possible endogeneity issues.

α_2 provides the effect of unexpected deposit flows on new loan extension and ω_2 captures this effect for banks less exposed to off-balance sheet funding liquidity risk. These coefficients

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[4] We remove time dummies and include the growth rate of real GDP per capita in robustness checks to control for loan demand.

are expected to be positive. Unexpected deposit flows should positively impact banks loan extension because deposits are one of the main financing sources of commercial banks.

α_3 captures the effect on loan extension of the exposure to off-balance sheet funding liquidity risk. ω_3 captures this effect for banks that are not subject to unexpected deposit flows. α_3 and ω_3 are expected to be negative because banks' exposure to off-balance sheet funding liquidity risk should limit the extension of new loans. Indeed, the managers of banks with greater unused commitments are aware of the fact that they may need funds to satisfy greater liquidity demand from outstanding commitments.

Thus, intuitively, the impact of unexpected deposit flows on lending should be stronger for banks less exposed to off-balance sheet funding liquidity risk. Therefore, this effect should be negatively associated with the level of bank exposure to funding liquidity risk stemming from the off-balance sheet. Our main coefficient of interest ω_4 should be negative and significant.

2.4. Estimation method:

We use a dynamic panel regression model. For such models, Blundell and Bond (1998), Arellano and Bond (1991) and Anderson and Hsiao (1982) suggest General Method of Moment (GMM) estimation procedures because the presence of the lagged dependent variable generates correlation between the regressor and the error term which leads to a bias in the coefficient estimates (Nickell, 1981), which will be inconsistent (Shim, 2012). However, in the case of large time dimension, the dynamic panel bias becomes insignificant (Roodman, 2006, 2009) and as argued by kiviet (1995), the standard estimation procedures are asymptotically valid. In addition, Loutskina (2011) suggests that the bias becomes problematic when T is below 15 time periods and Judson and Owen (1999) indicate that fixed effects estimators perform better than GMM estimators when T is beyond 30. Hence, because the time dimension in our investigation is 101 (1990Q2-2015Q2), we use fixed effect estimations after performing Hausman tests. Several other papers in the literature also use fixed effect estimators because of a large time dimension (e.g. Kim and Sohn, 2017 and Berrospide and Edge, 2010). However, for robustness, we also estimate our equations without the lagged dependent variable.

3. Results:

In this paper, we investigate whether the impact of unexpected deposit flows on loan origination differs depending upon the level of bank exposure to off-balance sheet funding

liquidity risk. We split our sample in two groups according to bank size. We cluster standard errors at the bank level. Table 2 gives the results of our estimations.

Columns (1) and (4) give the results of equation (1). The results of equation (2) are displayed in Columns (2) and (5) . These results show that α_2 is not significant for large banks but it is positive and significant at 1% for small banks. Hence, unexpected deposit inflows (outflows) lead small banks, not large ones, to extend (cut) new loans. α_3 is negative and significant at 5% for large banks and at 1% for small banks. Therefore, being exposed to funding liquidity risk stemming from off-balance sheet leads commercial banks to produce fewer loans.

The results of our baseline model are presented in Columns (3) and (6). We find that ω_2 is not significant for large banks. Thus, unexpected deposit flows have no effect on new loan production of large banks less exposed to off-balance sheet funding liquidity risk. ω_2 is however found to be positive and significant at 1% for small banks. Under the influence of unexpected deposit inflows (outflows), less exposed small banks increase (decrease) their new loan production. We observe that a one standard deviation increase in our measure of unexpected deposit flows, increases their new loan production by 17.42% of its mean (from 1.55% to 1.82%).

We find that ω_3 is negative and significant at 5% for large banks and negative and significant at 1% for small banks. Thus, being exposed to off-balance sheet funding liquidity risk leads commercial banks, small or large, and less subject to unexpected changes in their deposits, to supply less loans. For large banks not subject to unexpected changes in their deposits, we observe that a one standard deviation increase in their off-balance sheet funding liquidity risk exposure is associated with a decline in their new loan production by 37.66% of its mean (from 1.54% to 0.96%). Concerning small banks not subject to deposit shocks, the results show that a one standard deviation increase in their off-balance sheet funding liquidity risk exposure leads to a decline in their new loan production by 83.87% of its mean (from 1.55% to 0.25%). These changes are economically large.

Our main coefficient of interest ω_4 is found to be not significant for large banks. Therefore, the effect of unexpected deposit flows on lending is not sensitive to large banks' exposure to off-balance sheet funding liquidity risk. However, ω_4 is significant and negative at 1% for small banks. This finding confirms our conjecture and indicates that for small banks, the effect of unexpected deposit flows on their loan production, is negatively associated with their exposure to off-balance sheet funding liquidity risk. Small banks more exposed to that type of funding liquidity risk have a lower growth of new loans when they experience an unexpected inflow of deposits compared to less exposed small banks. Similarly, less exposed small banks cut lending

to a lesser extent than more exposed small banks when they are subject to an unexpected outflow of deposits.

Overall, unexpected deposit inflows (outflows) lead only small U.S. commercial banks to increase (decrease) their new loan production. This result is consistent with empirical studies documenting the positive effect of deposits on bank lending. It is also in line with the theoretical prediction of Acharya and Naqvi (2012) indicating an increase in loan production following an inflow of deposits. However, our results show such a behavior only holds for small banks. Moreover, we show that small banks appear to be cautious as they jointly manage their deposits and off-balance sheet funding liquidity risk exposure. Their willingness to make new loans and to offer loan commitments when they benefit from positive deposit shocks is tempered by the fear of withdrawal risk. Nevertheless, when they are less exposed to off-balance sheet funding liquidity risk, their confidence is boosted when they experience unexpected deposit growth which leads them to increase their lending production. As to large banks, unexpected changes in their deposits do not significantly influence their lending production regardless of the degree of their exposure to off-balance sheet funding liquidity risk. This is probably because, conversely to small ones, they have easier access to alternative funds to finance their lending.

[insert table 2]

4. Further issues:

4.1. Crisis period:

Banks' lending behavior can be different during crisis periods. We therefore conduct our investigation by considering the GFC. We consider the following specification:

$$
\begin{aligned}
\Delta loan_{i,t} = \ &\psi_i + \ \xi_t + \varphi_1 \Delta loan_{i,t-1} + \varphi_2 UDF_{i,t-1} + \varphi_3 UDF_{i,t-1} * GFC_t \\
&+ \varphi_4 OBFLR_{i,t-1} + \varphi_5 OBFLR_{i,t-1} * GFC_t \\
&+ \varphi_6 UDF_{i,t-1} * OBFLR_{i,t-1} + \varphi_7 UDF_{i,t-1} * OBFLR_{i,t-1} * GFC_t \\
&+ \varphi Z_{i,t-1} + \ \varepsilon_{i,t}
\end{aligned} \tag{4}
$$

Where GFC_t is a dummy variable equal to 1 during the 2007Q3-2009Q2 period. Estimation results are presented in table 3. Our findings also hold during the GFC. During that period, unexpected changes in deposits did not influence large banks in their lending decisions and the impact of such changes did not depend on large banks' exposure to off-balance sheet funding

liquidity risk. However, for small banks, the results show that during the GFC, unexpected changes in their deposits positively impacted their lending production and this impact was negatively related to their off-balance sheet liquidity risk exposure. More importantly, we find φ_7 to be smaller than φ_6 indicating that the negative relationship was stronger during the GFC. This is probably because loan commitments are callable at the borrower's option and the borrower will mostly exercise the option when markets are less likely to meet his needs. During the GFC, markets could not easily provide funds to bank borrowers. Thus, the demand for funds at banks was more important which made them more reluctant to generate loans even when they experienced positive deposit shocks. In addition, as shown by our data, small banks were more exposed to off-balance sheet funding liquidity risk during the GFC than during normal times.

[insert table 3]

4.2. Does banks' on-balance sheet liquidity level matter?

In this sub-section, we conduct our investigation by considering banks' on-balance-sheet liquidity level. Indeed, when banks experience an unexpected outflow (inflow) of deposits, less liquid banks might be more (less) willing to cut (increase) their loans than their peers holding more liquid assets. The latter might also less consider, in their loan production, their exposure to funding liquidity risk stemming from off-balance sheet than less liquid banks. Therefore, we split our sample to isolate less liquid banks from more liquid banks. Specifically, we proxy on-balance sheet liquidity by the ratio of total liquid assets to total assets and we assume that banks that are above the 75th percentile of this ratio, are relatively more liquid banks.

Table 4 presents the results of our estimations. They are globally similar to our main results for large banks. Concerning small banks, ω_2 is positive and significant at 1% in all estimations. Regardless of high liquid they are on the balance sheet, small banks less exposed to off-balance sheet funding liquidity risk increase (decrease) their lending production after experiencing an unexpected inflow (outflow) of deposits. Most interestingly, ω_4 is negative and significant for less liquid small banks and non-significant for more liquid ones. Such a result indicates that while less liquid small banks account for their exposure to off-balance sheet funding liquidity risk to produce or to cut loans when they experience an unexpected flow of deposits, more liquid banks do not. For such banks, the effect of unexpected flow of deposits is not sensitive to their exposure to off-balance sheet funding liquidity risk. This is because, contrary to less

liquid banks, they have enough liquidity to satisfy liquidity demand. All in all, small banks holding less liquid assets and more exposed to off-balance sheet liquidity risk produce fewer loans than less liquid and less exposed peers.

[insert table 4]

5. Robustness tests:

We perform several tests to check whether our results are robust. Firstly, we use fixed effect estimators because the time dimension in our investigation is large. As discussed above, it is argued that the presence of the lagged dependent variable may lead to inconsistent coefficients if General Method of Moment (GMM) estimation procedures are not used. Thus, to check the robustness of our results, we drop the lagged dependent variable and estimate our equations. We find similar results (see appendix B).

Secondly, we use alternative methodologies to compute the unexpected flow of deposits. We adapt the method used by Soedarmono et al. (2017) and Foos et al. (2010) to compute abnormal loan growth[5]. Firstly, we compare the deposit growth at each bank level to the aggregate deposit growth by also taking bank size into consideration. Thus, for small (large) banks, the unexpected flow of deposits is the difference between the deposit growth of the small (large) bank i and the aggregate deposit growth of small (large) banks. Secondly, we use the difference between each bank's deposit growth and the median deposit growth for each quarter. Using these alternative methodologies, our main results remain unchanged (see appendix C).

We also use core deposits as an alternative variable to total deposits. Banks' core deposits are the most stable deposits and constitute the most stable source of funds for loans. Hence, banks that hold a large portion of core deposits may have more incentives to lend. Our estimations with this type of deposits give similar results with our baseline models (see appendix D).

In addition, we limit our sample to banks that are strongly focused on intermediation activities that we name "traditional banks". These banks are heavily focused on deposits and loans. We select banks with a ratio of total deposits to total assets and a ratio of total loans to

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[5] In their studies, they estimate abnormal loan growth by computing the difference between bank i's loan growth and the aggregate loan growth in the banking system. They also make the difference between an individual bank's loan growth and the median loan growth of banks from the same country and year.

total assets above 30%. Considering this restricted sample of "traditional banks", our findings remain unchanged (see appendix E).

We capture the unexpected flow of deposits by including time fixed effects in equation (1) to account for macroeconomic effects. As a robustness check, we replace time dummies by macroeconomic factors that explain the flow of deposits, namely the TED spread and the change in the consumer price index (CPI). In our baseline model, we also analyze the conditional impact of an unexpected flow of deposits on loan production by using time fixed effects. We replace the time dummies by the growth rate of real GDP per capita. GDP allows to control for loan demand effects (De Haas et al., 2015; Carlson et al., 2013). Using these macroeconomic variables, our results remain unchanged (see appendix F, table 1F and table 2F).

In this study, because mergers and acquisitions can disturb our analysis, we control for their effect by including a dummy variable. Instead, we also exclude bank-quarter observations with quarterly growth of total assets higher than 10%. We find similar results (see appendix G).

Finally, using the sub-sample of small banks, we remove the lag dependent variable from equation (2)[6] and compute the effect of an unexpected flow of deposits on lending at different levels of the exposure to off-balance sheet funding liquidity risk. The results are presented in appendix H and they are in line with our findings. The coefficient of the unexpected flow of deposits decreases gradually as the exposure to off-balance sheet funding liquidity risk increases.

6. Conclusion

Using U.S. commercial banks data, we investigate whether the impact of an unexpected flow of deposits on loan origination depends on the degree of banks' off-balance sheet funding liquidity risk exposure. We account for bank size, the global financial crisis of 2007-2009 (GFC) and bank liquidity on the asset side of the balance sheet. The results show that large banks are not sensitive to deposit shocks regardless of their on-balance or off-balance sheet liquidity positions. However, small banks are sensitive to such shocks, unexpected deposit flows being positively associated with lending. The impact on lending is nevertheless negatively associated with their exposure to off-balance sheet funding liquidity risk and the relationship is even stronger during the GFC. Such a relationship is mostly relevant for small

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[6] We use the command "margins, dydx()" in STATA 14. This command works with models without lagged dependent variables.

banks holding relatively less liquid assets on their balance sheet. Such banks account for their exposure to liquidity demand when producing new loans driven by an unexpected increase in deposits. Our results have policy implications and indicate that unexpected deposit inflows due, for example, to the failure of other banks or market disruptions may not be as easily fueled to borrowers.

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Table 1A: Definition of variables and general descriptive statistics

Variable	definitions	Obs	Mean	Std. Dev.	Min	Max
Δloan	Quarterly growth rate of the sum of net loans and unused commitments	599,263	0.0160	0.0444	-0.0786	0.1735
Δdep	Changes in total deposits scaled by lagged total assets	599,263	0.0156	0.0467	-0.0735	0.1859
Δcoredep	Changes in core deposits scaled by lagged total assets	430,677	0.0135	0.0447	-0.0766	0.1701
UDF^L	Unexpected deposit flows for large banks, residual from equation (1).	16,821	0.0000	0.0373	-0.1749	0.1916
UDF^S	Unexpected deposit flows for small banks, residual from equation (1).	372,085	0.0000	0.0412	-0.2414	0.2601
UDF^{DL}	Unexpected deposit flows for large banks, the difference between large bank i's deposit growth and the growth of the aggregate deposit of large banks.	27,827	0.0080	0.0541	-0.1175	0.3119
UDF^{DS}	Unexpected deposit flows for small banks, the difference between small bank i's deposit growth and the growth of the aggregate deposit of small banks.	570,353	0.0177	0.0567	-0.1195	0.2614
UDF^{med}	Unexpected deposit flows, the difference between a bank's deposit growth and the median of deposit growth between banks for each quarter.	599,263	0.0089	0.0562	-0.1293	0.2453
UDF^{corL}	Unexpected core deposit flows for large banks, residual from equation (1)	16,542	0.0000	0.0326	-0.1894	0.1784
UDF^{corS}	Unexpected core deposit flows for small banks, residual from equation (1)	368,204	0.0000	0.0400	-0.2077	0.2349
OBFLR	The exposure to off-balance sheet funding liquidity risk	599,263	0.1207	0.1688	0.0000	0.7909
size	The natural logarithm of total assets	599,263	18.3448	1.3571	11.6351	28.3730
leverage	Equity to total assets ratio	599,263	0.1032	0.0371	0.0553	0.2702

(continued)

Table 1 (continued)

Variable	definitions	Obs	Mean	Std. Dev.	Min	Max
NPL	Non-performing loans over total loans	558,130	0.0131	0.0191	0.0000	0.0928
CIBD	Cost of interest-bearing deposits	596,860	0.0361	0.0172	0.0036	0.0708
M&A	A dummy variable for mergers and acquisitions. It is equal to one if the asset growth rate is lower than 10% during the quarter and zero otherwise	599,263	0.9350	0.2466	0.0000	1.0000
REL	Real estate exposure defined as the share of loans secured by real estate in loan portfolio.	433,151	0.5767	0.2054	0.0881	0.9457
ROE	Return on equity.	432,985	0.1033	0.0974	-0.2638	0.3059
INF	Change in consumer price index	599,263	1.0993	0.8807	-5.0123	3.3233
rgdpc	The growth rate of GDP per capita	599,263	0.0036	0.0061	-0.0234	0.0164
TED spread	The difference between the three-month LIBOR and the three-month T-bill interest rates	599,263	0.0053	0.0033	0.0015	0.0245

Table 1B: T-test of the difference of means

Types of banks	variables	Normal time	Crisis time	p-value
	Δloan	1.62%	1.30%	0.00
Small banks	UDF^S	0%	0%	1.00
	OBFLR	11.96%	14.55%	0.00
	Δloan	1.65%	1.18%	0.00
Larges banks	UDF^L	0%	0%	1.00
	OBFLR	11.40%	10.16%	0.00

Table 2: Effect of unexpected deposit flows on banks' new loan origination
This table highlights the conditional impact of unexpected deposit flows on banks' new loan origination. UDF is the unexpected deposit flows. Δdep is deposit flows. Δloan is the quarterly growth rate of the sum of net loans plus unused commitments. OBFLR is the exposure to off-balance sheet funding liquidity risk. SIZE is the natural logarithm of total assets. LEVERAGE is equity to total assets ratio. NPL is non-performing loans over total loans. CIBD is the cost of interest-bearing deposits. ROE is return on equity. REL is the share of loans secured by real estate in loan portfolio. M&A is a dummy variable for mergers and acquisitions. It is equal to one if the asset growth rate is lower than 10% during the quarter and zero otherwise. "large" corresponds to banks with total assets higher than $1 billion and "small" corresponds to banks with total assets lower or equal to $1 billion. Standard errors are in parentheses. *indicate statistical significance at the 10% level. **indicate statistical significance at the 5% level. ***indicate statistical significance at the 1% level. Right-hand side variables are lagged one quarter.

	(1)	(2)	(3)	(4)	(5)	(6)
	large			small		
Dependent variable	Δdep	Δloan	Δloan	Δdep	Δloan	Δloan
Lag dependent variable		0.0320^{*}	0.0330^{*}		0.0123^{***}	0.0118^{***}
		(0.0175)	(0.0175)		(0.00401)	(0.00401)
UDF (ω_2, α_2)		-0.000851	-0.00776		0.0562^{***}	0.0658^{***}
		(0.0115)	(0.0129)		(0.00314)	(0.00360)
OBFLR (ω_3, α_3)	0.00904	-0.0356^{**}	-0.0352^{**}	0.0130^{***}	-0.0764^{***}	-0.0768^{***}
	(0.0115)	(0.0176)	(0.0175)	(0.00223)	(0.00394)	(0.00397)
UDF*OBFLR (ω_4)			0.0745			-0.0693^{***}
			(0.0733)			(0.0181)
SIZE	-0.0272^{***}	-0.0176^{***}	-0.0177^{***}	-0.0213^{***}	-0.0188^{***}	-0.0188^{***}
	(0.00298)	(0.00190)	(0.00190)	(0.000802)	(0.000762)	(0.000762)
LEVERAGE	0.0844^{**}	0.0467	0.0470	0.289^{***}	0.157^{***}	0.158^{***}
	(0.0348)	(0.0356)	(0.0358)	(0.0101)	(0.00917)	(0.00916)
NPL	-0.191^{***}	-0.359^{***}	-0.359^{***}	-0.290^{***}	-0.333^{***}	-0.334^{***}
	(0.0388)	(0.0550)	(0.0550)	(0.00806)	(0.00848)	(0.00847)
CIBD	-0.0166			0.817^{***}		
	(0.0938)			(0.0384)		
ROE	0.0126^{**}	0.00918	0.00915	0.00550^{***}	0.00399^{***}	0.00397^{***}
	(0.00563)	(0.00570)	(0.00570)	(0.00139)	(0.00139)	(0.00139)
REL	-0.0132^{*}	-0.00602	-0.00624	0.000248	0.00298^{*}	0.00301^{*}
	(0.00725)	(0.00721)	(0.00723)	(0.00163)	(0.00161)	(0.00161)
M&A	0.000977	-0.000689	-0.000687	-0.00169^{**}	-0.00879^{***}	-0.00882^{***}
	(0.00146)	(0.00163)	(0.00163)	(0.000712)	(0.000563)	(0.000563)
Time fixed effect	yes	yes	yes	yes	yes	yes
Banks fixed effect	yes	yes	yes	yes	yes	yes
constant	0.592^{***}	0.397^{***}	0.399^{***}	0.310^{***}	0.346^{***}	0.346^{***}
	(0.0646)	(0.0408)	(0.0407)	(0.0141)	(0.0136)	(0.0137)
r2	0.186	0.204	0.204	0.206	0.186	0.186
N	16821	14951	14951	372085	329951	329951

Table 3: GFC and effect of unexpected deposit flows on banks' new loan origination

This table highlights the conditional impact of unexpected deposit flows on banks' new loan origination considering the global financial crisis (GFC). UDF is the unexpected deposit flows. Δloan is the quarterly growth rate of the sum of net loans plus unused commitments. OBFLR is the exposure to off-balance sheet funding liquidity risk. GFC is a dummy variable equals to 1 during the global financial crisis. "large" corresponds to banks with total assets higher than $1 billion and "small" corresponds to banks with total assets lower or equal to $1 billion. Standard errors are in parentheses. *indicate statistical significance at the 10% level. **indicate statistical significance at the 5% level. ***indicate statistical significance at the 1% level. Right-hand side variables are lagged one quarter.

Dependent variable	Δloan	
	large	small
Lag dependent variable	0.0318^*	0.00997^{**}
	(0.0175)	(0.00399)
UDF (φ_2)	-0.00604	0.0636^{***}
	(0.0134)	(0.00367)
UDF* GFC (φ_3)	-0.0182	0.0924^{***}
	(0.0359)	(0.0105)
OBFLR (φ_4)	-0.0320^*	-0.0724^{***}
	(0.0171)	(0.00400)
OBFLR * GFC (φ_5)	-0.0620^{***}	-0.105^{***}
	(0.0190)	(0.00457)
UDF*OBFLR (φ_6)	0.0789	-0.0624^{***}
	(0.0744)	(0.0192)
UDF*OBFLR* GFC (φ_7)	0.0396	-0.125^{***}
	(0.303)	(0.0480)
Control variables	yes	yes
Time fixed effect	yes	yes
Bank fixed effect	yes	yes
constant	0.402^{***}	0.344^{***}
	(0.0404)	(0.0136)
r2	0.205	0.187
N	14951	329951

Table 4: Effect of unexpected deposit flows on banks' new loan origination according to banks liquidity level

This table highlights the conditional impact of unexpected deposit flows on banks' new loan origination according to their liquidity level. UDF is the unexpected deposit flows. Δloan is the quarterly growth rate of the sum of net loans plus unused commitments. OBFLR is the exposure to off-balance sheet funding liquidity risk. Liquid banks are banks that are above the 75th percentile of the ratio of liquid assets to total assets. Less liquid banks are the ones below the 75th percentile of this ratio. "large" corresponds to banks with total assets higher than \$1 billion and "small" corresponds to banks with total assets lower or equal to \$1 billion. Standard errors are in parentheses. *indicate statistical significance at the 10% level. **indicate statistical significance at the 5% level. ***indicate statistical significance at the 1% level. Right-hand side variables are lagged one quarter.

Dependent variable	Δloan			
	large		small	
	Less liquid	liquid	Less liquid	liquid
Lag dependent variable	0.0284	0.0282	0.0153***	-0.0443***
	(0.0208)	(0.0381)	(0.00441)	(0.00747)
UDF (ω_2)	-0.00308	-0.0316*	0.0644***	0.0285***
	(0.0169)	(0.0183)	(0.00402)	(0.00704)
OBFLR (ω_3)	-0.0426**	-0.0358	-0.0836***	-0.0866***
	(0.0174)	(0.0396)	(0.00453)	(0.00703)
UDF*OBFLR (ω_4)	0.0729	0.122	-0.0599***	-0.0520
	(0.0840)	(0.162)	(0.0207)	(0.0369)
Control variables	yes	yes	yes	yes
Time fixed effect	yes	yes	yes	yes
Bank fixed effect	yes	yes	yes	yes
constant	0.461***	0.221	0.397***	0.270***
	(0.0513)	(0.161)	(0.0142)	(0.0306)
r2	0.219	0.282	0.200	0.251
N	11265	3686	255253	74695

Appendix A: correlation matrix

	Δloan	Δdep	Δcoredep	UDF^L	UDF^S	UDF^{med}	UDF^{DL}	UDF^{DS}	UDF^{corL}	UDF^{corS}	OBFLR	size
Δloan	1											
Δdep	0.2988	1										
Δcoredep	0.2321	0.8629	1									
UDF^L	0.2841	0.9025	0.6971	1								
UDF^S	0.1747	0.8909	0.7675	0	1							
UDF^{med}	0.3115	0.9779	0.8387	0.8632	0.8958	1						
UDF^{DL}	0.2687	0.8922	0.6523	0.8319	0	0.9579	1					
UDF^{DS}	0.3058	0.9764	0.8394	0	0.8865	0.9894	0	1				
UDF^{corL}	0.2411	0.6919	0.9078	0.7642	0	0.6576	0.6036	0	1			
UDF^{corS}	0.1427	0.7644	0.8945	0	0.8576	0.7671	0	0.7591	0	1		
OBFLR	0.146	0.0183	0.0084	-0.0085	-0.0184	0.0216	-0.0025	0.0247	-0.0078	-0.016	1	
size	-0.0203	-0.0027	-0.0035	0.0438	0.0432	0.0061	-0.1134	0.0316	0.0395	0.038	-0.1199	1
leverage	0.0731	0.0157	-0.0001	-0.0299	-0.1001	0.0357	-0.0015	0.0413	-0.0215	-0.0872	0.0888	-0.1594
NPL	-0.1784	-0.1327	-0.0853	0	-0.0176	-0.1135	-0.0589	-0.1232	-0.0033	-0.014	-0.0361	0.0772
REL	0.0044	0.0276	0.0284	0.0013	0.0015	0.0292	0.0014	0.0351	0.0021	0.0031	-0.0004	0.1774
ROE	0.029	-0.0268	-0.0448	0.0233	0.0042	-0.0208	0.0389	-0.0212	0.0186	-0.0012	-0.0168	0.0027
CIBD	0.0554	0.0661	0.052	0.0291	0.015	0.0378	0.0387	0.0179	0.0291	0.0126	-0.0582	-0.2532
rgdpc	0.0589	-0.0241	-0.0195	0	0	-0.0077	0.0492	0.042	0	0	0.0088	-0.0185
INF	0.0179	-0.0079	-0.0129	0	0	0.0043	-0.0091	-0.0194	0	0	0.0028	-0.0129
TED spread	0.017	0.0597	0.0246	0	0	0.022	0.0047	0.0268	0	0	0.0037	-0.0385

(continued)

Appendix A (continued)

	leverage	NPL	REL	ROE	CIBD	rgdpc	INF	TED spread
leverage	1							
NPL	-0.0667	1						
REL	-0.0102	0.0503	1					
ROE	-0.0714	-0.1681	-0.066	1				
CIBD	-0.1352	-0.1163	-0.2915	0.0627	1			
rgdpc	0.0097	-0.09	-0.0066	0.1101	-0.1411	1		
INF	-0.0074	-0.0237	-0.0132	0.0133	0.1024	0.0796	1	
TED spread	-0.0003	-0.0701	-0.0492	-0.0631	0.3973	-0.3615	-0.1323	1

Appendix B: Baseline models without lagged dependent variable

This table highlights the conditional impact of unexpected deposit flows on banks' new loan origination using our baseline models without the lagged dependent variable. Δloan is the quarterly growth rate of the sum of net loans plus unused commitments. UDF is the unexpected deposit flows. OBFLR is the exposure to off-balance sheet funding liquidity risk. "large" corresponds to banks with total assets higher than $1 billion and "small" corresponds to banks with total assets lower or equal to $1 billion. Standard errors are in parentheses. *indicate statistical significance at the 10% level. **indicate statistical significance at the 5% level. ***indicate statistical significance at the 1% level. Right-hand side variables are lagged one quarter.

Dependent variable	Δloan	
	Large	Small
UDF (ω_2)	-0.00141	0.0676***
	(0.0125)	(0.00362)
OBFLR (ω_3)	-0.0329*	-0.0754***
	(0.0176)	(0.00397)
UDF*OBFLR (ω_4)	0.0621	-0.0718***
	(0.0753)	(0.0181)
Control variables	yes	yes
Time fixed effect	yes	yes
Bank fixed effect	yes	yes
constant	0.400***	0.347***
	(0.0410)	(0.0137)
r2	0.204	0.186
N	14951	329951

APENDIX C: Alternative methodologies of unexpected deposit flows' computation

This table highlights the conditional impact of unexpected deposit flows on banks' new loan origination using two alternative methodologies of unexpected deposit flows' computation. UDF is the unexpected flow of deposits. In columns (1) and (2), it is measured by the difference between the deposit growth of the small (large) bank i and the growth of the aggregate deposit of small (large) banks. In columns (3) and (4), it is measured by the difference between a bank's deposit growth and the median of deposit growth between banks for each quarter. Δloan is the quarterly growth rate of the sum of net loans plus unused commitments. OBFLR is the exposure to off-balance sheet funding liquidity risk. "large" corresponds to banks with total assets higher than \$1 billion and "small" corresponds to banks with total assets lower or equal to \$1 billion. Standard errors are in parentheses. *indicate statistical significance at the 10% level. **indicate statistical significance at the 5% level. ***indicate statistical significance at the 1% level. Right-hand side variables are lagged one quarter.

Dependent variable	Δloan			
	(1)	(2)	(3)	(4)
	large	small	large	small
Lag dependent variable	0.0356**	0.00877**	0.0359**	0.00886**
	(0.0179)	(0.00376)	(0.0170)	(0.00376)
UDF (ω_2)	-0.00105	0.0578***	-0.00670	0.0590***
	(0.00878)	(0.00275)	(0.00972)	(0.00276)
OBFLR (ω_3)	-0.0417**	-0.0758***	-0.0343**	-0.0762***
	(0.0180)	(0.00383)	(0.0171)	(0.00382)
UDF*OBFLR (ω_4)	0.0200	-0.0483***	0.00701	-0.0565***
	(0.0329)	(0.0132)	(0.0331)	(0.0132)
Control variables	yes	yes	yes	yes
Time fixed effect	yes	yes	yes	yes
Bank fixed effect	yes	yes	yes	yes
constant	0.393***	0.330***	0.561***	0.329***
	(0.0419)	(0.0130)	(0.0499)	(0.0130)
r2	0.201	0.190	0.223	0.190
N	15926	371784	16878	372052

Appendix D: Unexpected flow of core deposits

This table highlights the conditional impact of unexpected core deposit flows on banks' new loan origination. UDF^{cor} is the unexpected core deposit flows. Δcoredep is core deposit flows. Δloan is the quarterly growth rate of the sum of net loans plus unused commitments. OBFLR is the exposure to off-balance sheet funding liquidity risk. SIZE is the natural logarithm of total assets. LEVERAGE is equity to total assets ratio. NPL is non-performing loans over total loans. CIBD is the cost of interest-bearing deposits. ROE is return on equity. REL is the share of loans secured by real estate in loan portfolio. M&A is a dummy variable for mergers and acquisitions. It is equal to one if the asset growth rate is lower than 10% during the quarter and zero otherwise. "large" corresponds to banks with total assets higher than $1 billion and "small" corresponds to banks with total assets lower or equal to $1 billion. Standard errors are in parentheses. *indicate statistical significance at the 10% level. **indicate statistical significance at the 5% level. ***indicate statistical significance at the 1% level. Right-hand side variables are lagged one quarter.

	large		small	
Dependent variable	Δcoredep	Δloan	Δcoredep	Δloan
Lag dependent variable		0.0310*		0.0140***
		(0.0176)		(0.00405)
UDF^{cor} (ω_2)		0.00953		0.0489***
		(0.0129)		(0.00342)
OBFLR (ω_3)	0.0110	-0.0352**	0.00872***	-0.0774***
	(0.00845)	(0.0175)	(0.00199)	(0.00398)
UDF^{cor} *OBFLR (ω_4)		-0.0634		-0.0742***
		(0.0811)		(0.0186)
SIZE	-0.0198***	-0.0176***	-0.0187***	-0.0184***
	(0.00247)	(0.00190)	(0.000704)	(0.000765)
LEVERAGE	0.0286	0.0457	0.237***	0.146***
	(0.0275)	(0.0355)	(0.00895)	(0.00911)
NPL	-0.100***	-0.357***	-0.222***	-0.332***
	(0.0321)	(0.0551)	(0.00719)	(0.00856)
CIBD	0.0228		0.768***	
	(0.0762)		(0.0347)	
ROE	0.00229	0.00919	-0.00319**	0.00416***
	(0.00443)	(0.00575)	(0.00131)	(0.00140)
REL	-0.00918	-0.00637	-0.000476	0.00294*
	(0.00651)	(0.00721)	(0.00145)	(0.00162)
M&A	0.00171	-0.000367	0.000496	-0.0113***
	(0.00116)	(0.00159)	(0.000645)	(0.000555)
Time fixed effect	yes	yes	yes	yes
Bank fixed effect	yes	yes	yes	yes
constant	0.429***	0.397***	0.269***	0.342***
	(0.0534)	(0.0409)	(0.0123)	(0.0137)
r2	0.176	0.204	0.200	0.184
N	16542	14840	368204	328495

Appendix E: "Traditional" banks

This table highlights the conditional impact of unexpected deposit flows on banks' new loan origination of "traditional" banks. Those banks are the ones with total deposits to total assets ratio and total loans over total assets higher than 30%. Δloan is the quarterly growth rate of the sum of net loans plus unused commitments. UDF is the unexpected deposit flows. OBFLR is the exposure to off-balance sheet funding liquidity risk. "large" corresponds to banks with total assets higher than $1 billion and "small" corresponds to banks with total assets lower or equal to $1 billion. Standard errors are in parentheses. *indicate statistical significance at the 10% level. **indicate statistical significance at the 5% level. ***indicate statistical significance at the 1% level. Right-hand side variables are lagged one quarter.

Dependent variable	Δloan	
	large	small
Lag dependent variable	0.0342^{*}	0.0129^{***}
	(0.0181)	(0.00408)
UDF (ω_2)	-0.00719	0.0666^{***}
	(0.0130)	(0.00369)
OBFLR (ω_3)	-0.0357^{**}	-0.0793^{***}
	(0.0165)	(0.00397)
UDF*OBFLR (ω_4)	0.0775	-0.0668^{***}
	(0.0734)	(0.0188)
Control variables	yes	yes
Time fixed effect	yes	yes
Bank fixed effect	yes	yes
constant	0.412^{***}	0.373^{***}
	(0.0451)	(0.0131)
r2	0.210	0.191
N	14363	315039

Appendix F: Using macroeconomic variables

Table 1F: Unexpected flow of deposits captured using macroeconomic variables

This table highlights the conditional impact of unexpected deposit flows on banks' new loan origination. UDF is the unexpected deposit flows. It is captured from equation (1) by using macroeconomic factors. Δdep is deposit flows. Δloan is the quarterly growth rate of the sum of net loans plus unused commitments. OBFLR is the exposure to off-balance sheet funding liquidity risk. SIZE is the natural logarithm of total assets. LEVERAGE is equity to total assets ratio. NPL is non-performing loans over total loans. CIBD is the cost of interest-bearing deposits. ROE is return on equity. REL is the share of loans secured by real estate in loan portfolio. M&A is a dummy variable for mergers and acquisitions. It is equal to one if the asset growth rate is lower than 10% during the quarter and zero otherwise. TED spread is the difference between the three-month LIBOR and the three-month T-bill interest rates and INF is change in consumer price index. "large" corresponds to banks with total assets higher than $1 billion and "small" corresponds to banks with total assets lower or equal to $1 billion. Standard errors are in parentheses. *indicate statistical significance at the 10% level. **indicate statistical significance at the 5% level. ***indicate statistical significance at the 1% level. Right-hand side variables are lagged one quarter.

| | large | | small | |
Dependent variable	Δdep	Δloan	Δdep	Δloan
Lag dependent variable		0.0326^{*}		0.0115^{***}
		(0.0176)		(0.00401)
UDF (ω_2)		-0.00505		0.0640^{***}
		(0.0130)		(0.00357)
OBFLR (ω_3)	0.0140	-0.0352^{**}	0.0242^{***}	-0.0761^{***}
	(0.0128)	(0.0176)	(0.00212)	(0.00396)
UDF*OBFLR (ω_4)		0.0544		-0.0545^{***}
		(0.0726)		(0.0178)
SIZE	-0.0206^{***}	-0.0177^{***}	-0.0122^{***}	-0.0184^{***}
	(0.00220)	(0.00189)	(0.000555)	(0.000761)
LEVERAGE	0.119^{***}	0.0469	0.327^{***}	0.160^{***}
	(0.0330)	(0.0358)	(0.0101)	(0.00918)
NPL	-0.144^{***}	-0.359^{***}	-0.256^{***}	-0.332^{***}
	(0.0312)	(0.0549)	(0.00773)	(0.00846)
CIBD	-0.122^{***}		0.130^{***}	
	(0.0452)		(0.0117)	
ROE	0.00773	0.00915	-0.0000684	0.00391^{***}
	(0.00570)	(0.00570)	(0.00138)	(0.00139)
REL	-0.00607	-0.00615	0.0101^{***}	0.00352^{**}
	(0.00714)	(0.00723)	(0.00163)	(0.00161)
M&A	0.00171	-0.000655	-0.00233^{***}	-0.00873^{***}
	(0.00144)	(0.00163)	(0.000718)	(0.000564)
TED spread	0.673^{***}		0.203^{***}	
	(0.121)		(0.0333)	
INF	0.000415		0.000423^{***}	
	(0.000390)		(0.0000962)	
constant	0.453^{***}	0.399^{***}	0.194^{***}	0.338^{***}
	(0.0486)	(0.0407)	(0.0101)	(0.0136)
r2	0.167	0.204	0.173	0.186
N	16821	14951	372085	329951

Table 2F: Control of macroeconomic effects with GDP

This table highlights the conditional impact of unexpected deposit flows on banks' new loan origination. In equation (3), we replace time dummies by the growth rate of GDP per capita (rgdpc). UDF is the unexpected deposit flows. Δdep is deposit flows. Δloan is the quarterly growth rate of the sum of net loans plus unused commitments. OBFLR is the exposure to off-balance sheet funding liquidity risk. SIZE is the natural logarithm of total assets. LEVERAGE is equity to total assets ratio. NPL is non-performing loans over total loans. REL is the share of loans secured by real estate in loan portfolio. M&A is a dummy variable for mergers and acquisitions. It is equal to one if the asset growth rate is lower than 10% during the quarter and zero otherwise. "large" corresponds to banks with total assets higher than \$1 billion and "small" corresponds to banks with total assets lower or equal to \$1 billion. Standard errors are in parentheses. *indicate statistical significance at the 10% level. **indicate statistical significance at the 5% level. ***indicate statistical significance at the 1% level. Right-hand side variables are lagged one quarter.

Dependent variable	Δloan	
	large	small
Lag dependent variable	0.0403**	0.0119***
	(0.0177)	(0.00404)
UDF (ω_2)	-0.00935	0.0605***
	(0.0129)	(0.00362)
OBFLR (ω_3)	-0.0272*	-0.0533***
	(0.0154)	(0.00314)
UDF*OBFLR (ω_4)	0.0659	-0.0662***
	(0.0759)	(0.0180)
SIZE	-0.0129***	-0.0103***
	(0.00123)	(0.000409)
LEVERAGE	0.0922**	0.198***
	(0.0367)	(0.00885)
NPL	-0.425***	-0.383***
	(0.0459)	(0.00810)
ROE	0.0164***	0.00745***
	(0.00576)	(0.00138)
REL	0.000535	0.0145***
	(0.00641)	(0.00154)
M&A	0.00102	-0.00921***
	(0.00166)	(0.000566)
rgdpc	0.253***	0.233***
	(0.0686)	(0.0143)
constant	0.295***	0.192***
	(0.0263)	(0.00713)
r2	0.181	0.168
N	14951	329951

Appendix G:

This table highlights the conditional impact of unexpected deposit flows on banks' new loan origination using a sample without bank-quarter observations with quarterly asset growth higher than 10%. UDF is the unexpected deposit flows. Δdep is deposit flows. Δloan is the quarterly growth rate of the sum of net loans plus unused commitments. OBFLR is the exposure to off-balance sheet funding liquidity risk. SIZE is the natural logarithm of total assets. LEVERAGE is equity to total assets ratio. NPL is non-performing loans over total loans. CIBD is the cost of interest-bearing deposits. ROE is return on equity. REL is the share of loans secured by real estate in loan portfolio. "large" corresponds to banks with total assets higher than $1 billion and "small" corresponds to banks with total assets lower or equal to $1 billion. Standard errors are in parentheses. *indicate statistical significance at the 10% level. **indicate statistical significance at the 5% level. ***indicate statistical significance at the 1% level. Right-hand side variables are lagged one quarter.

	large		small	
Dependent variable	Δdep	Δloan	Δdep	Δloan
Lag dependent variable		0.0628***		-0.0290***
		(0.0210)		(0.00398)
UDF (ω_2)		0.00178		0.0513***
		(0.0130)		(0.00360)
OBFLR (ω_3)	0.00573	-0.0516***	0.00599***	-0.0715***
	(0.00818)	(0.0170)	(0.00145)	(0.00375)
UDF*OBFLR (ω_4)		0.134		-0.0587**
		(0.0977)		(0.0237)
SIZE	-0.00577***	-0.00433***	-0.00881***	-0.0107***
	(0.00142)	(0.00133)	(0.000489)	(0.000565)
LEVERAGE	0.0559***	0.0342	0.133***	0.0303***
	(0.0212)	(0.0257)	(0.00677)	(0.00740)
NPL	-0.146***	-0.327***	-0.213***	-0.291***
	(0.0245)	(0.0417)	(0.00580)	(0.00791)
CIBD	-0.0735		0.525***	
	(0.0610)		(0.0271)	
ROE	0.00807**	0.0132***	0.00987***	0.00832***
	(0.00402)	(0.00457)	(0.00102)	(0.00126)
REL	-0.00852**	-0.00608	0.000388	0.00142
	(0.00409)	(0.00585)	(0.00106)	(0.00142)
Time fixed effect	yes	yes	yes	yes
Bank fixed effect	yes	yes	yes	yes
constant	0.140***	0.109***	0.116***	0.203***
	(0.0297)	(0.0285)	(0.00847)	(0.0101)
r2	0.123	0.259	0.141	0.140
N	14967	12338	349621	295460

Appendix H: Effect of unexpected deposit flows on small banks loan production at different levels of the exposure to off-balance sheet funding liquidity risk

This table shows the marginal effects of unexpected deposit flows on small banks' new loans. To compute these marginal effects, we regress the following equation:

$$\Delta loan_{i.t} = \gamma_i + \theta_t + \omega_1 UDF_{i.t-1} + \omega_2 OBFLR_{i.t-1} + \omega_3 UDF_{i.t-1} * OBFLR_{i.t-1} + \omega X_{i.t-1} + \mu_{i.t}$$

unexpected deposit flows at:	dy/dx	Std. Err	p value
10th percentile of OBFLR	0.0673762	0.0035976	0.000
25th percentile of OBFLR	0.0662861	0.0034657	0.000
50th percentile of OBFLR	0.063349	0.0032027	0.000
75th percentile of OBFLR	0.0575171	0.0031686	0.000
90th percentile of OBFLR	0.0441359	0.0050949	0.000